

Accelerator Systems Division Highlights for the Week Ending October 19, 2001

ASD/LBNL: Front End Systems

Ion source #3 is now producing 35 mA at 3% duty factor through the LEBT at the Integrated Testing Facility. Emittances were measured for a variety of beam currents and lens voltages, and it results that all rms emittances up to 35 mA are significantly smaller than the ones previously measured at 50 mA.

The conditioning speed for the RFQ coupler windows has increased substantially after we implemented a few changes suggested during a fact-finding meeting held on Oct. 22.

We prepared a presentation of front-end progress for the upcoming DOE-Review dry runs.

ASD/LANL: Warm Linac

We were back at Litton for acceptance testing of the 805-MHz, 2.5-MW, prototype R&D klystron. It is over one year late in delivery. We witnessed all of the critical tests, such as the 24 hour heat run at 2.75 MW peak, 10% duty, the harmonic power tests, the phase vs. drive tests, the P_{in} - P_{out} tests, the 1.5:1 VSWR tests, X-radiation, microwave radiation, and the heater hum tests. Results were the best, to date, but the tube did fail some specifications such as the power supply current, vacuum, and number of solenoid power supplies. (WBS 1.1.2.7)

High-Voltage pulse conditioning of the first 402-MHz klystron was up to 60 Hz before a controller board on the Marconi test stand failed. They expect to be back running by the end of this week. (WBS 1.4.1.1)
The first SRF circulators passed the factory acceptance test. Shipment to LANL is forthcoming. (WBS 1.4.1.1)

JLab prototype SRF fundamental power coupler tests were resumed this. The prototype high-voltage converter modulator (HVCN) powered the 805-MW klystron at 700-kW pulsed power, 1.3-ms pulse width, and 60-Hz repetition rate, for hours without faults. (WBS 1.4.1.1)

The IGBT cooling hoses have been installed in the prototype HVCN and the system is back in operation. (WBS 1.4.1.2)

The revised HVCN drawings for the 80-kV system are complete and submitted to procurement. (WBS 1.4.1.2)

LANL and ASD personnel were in Albuquerque to review the manufacturer design plans for the HVCN build-to-specification equipment control rack. The review was satisfactory. (WBS 1.4.1.2)

We released the RFP for the water skids. Bids are due Nov. 23. (WBS 1.4.2.5 and 1.4.4.5)

Machining of DTL tanks 3a and 3b is complete (Fig. 1). Problems with vacuum seal finishes have been rectified. The tanks have been shipped to GSI for copper plating. (WBS 1.4.2.2)

The MEBT chopper pulsed-power supply is operational on the bench. It meets our specifications. (WBS 1.4.5.1)

The BPM digital front-end board was shipped to Brookhaven for testing. (WBS 1.4.5.2)

Linac steering studies with errors were completed for the final DTL, CCL, and SRF linac configuration. Range of operating parameters was determined. The magnet power supply specification was generated. (WBS 1.4.5.3)



Fig. 1: DTL Tanks 3a and 3b at manufacturer's facility.

Proposed revisions to the IPS were submitted to ORNL. (WBS 1.4.6.1)

Acceptance criteria documents for the high-power RF system, high-voltage converter modulator, DTL, and CCL were completed by ASD and LANL technical leaders and signed off at LANL. Originals will hand carried to ORNL on Oct. 22. The remaining two documents (for the LLRF system and diagnostics) are also nearing completion. (WBS 1.4.6.1)

Jim Stovall moved from Los Alamos this week to begin a two-year change-of-station assignment at ORNL/SNS/ASD. There are now five such assignments from LANL at ORNL/SNS.

Zukun Chen has returned to LANL ESA Division this week after successful assignments with the SNS Mechanical Engineering Group. During her tenure, Zukun performed thermal/structural/electrical analyses in support of our DTL, CCL, and Diagnostic Plate designs. We thank Zukun for a job well done and wish her continued success on her new assignments in support of ESA Division. (WBS 1.4.6.7)

ASD/JLAB: Cold Linac

The Final Design Review of the 4.5 K Cold Box was completed.

Fabrication of remaining transfer line components continues.

Investigation of problems with vacuum leaks in recent attempts to test prototype cavities have been focusing on the seals, which are based on a successful design by DESY. Differences in materials, fabrication and assembly processes are all being investigated.

Testing of the second pair of fundamental power couplers at LANL was resumed after repairs were completed to the high voltage power supply to the RF test stand. Operating into a matched load, peak and average powers 40% above specification were achieved (700 kW peak at full duty cycle, compared with a specification of 500 kW).

First article end cans for the prototype cryomodule have been received.

Work continues on infrastructure installation.

ASD/BNL: Ring

Efforts are underway for equipment deliveries to SNS/OR. This equipment includes: the 17D120 power supply reference magnet; the 8D533 HEBT dipole; and the HEBT dipole stands. A truck left BNL today with the Ring dipole reference magnet and a stand for the HEBT dipole magnet. They should be in the RATS building next Monday.

Our magnet vendor, Tesla, reported that their first article HEBT dipole (8D533) and ring quadrupole (21Q40) are on the high seas and are due in New York harbor on 10/29/01. The 21Q40 will stay at BNL and the 8D533 will go directly to SNS/OR.

The first half-cell vacuum chamber assembly is being baked-out. The second chamber is undergoing BNL/QA inspections.

Mel van Essendelft, BNL/QA, is working with SGS Vostok, Moscow, to formulate an inspection plan for the Budker quadrupole contract, including the steel supplier.

Visitors from SNS/ASD included K. Boudwin, N. Holtkamp, R. Damm, S. Henderson and Graeme Murdock. Tours were arranged to show them the Magnet Assembly and Test Area, RF Assembly and Test Bay, Vacuum Assembly Area, Vacuum Lab, Controls Lab and Diagnostics Lab.

Preparations are underway for next week's dry run for the DOE Review.

Preparations are also being made for next week's design review of the Ring's Extraction Kicker System.

A RFQ package for the long injection magnet was sent out this week. A separate package was sent to T. Hunter.

Magnetic field quality measurements of the Ring arc dipole magnets were started this week.

Design and cost info on the HEBT Momentum Dump was sent to K. Reece.

A revised Handoff Criteria document has been received from D. Stout. BNL's comments will be sent to Dan after the upcoming DOE dry run.

Parameter Lists are being reviewed in preparation for the upcoming DOE Review.



Fig. #1 – Tour of BNL's Magnet Assembly Area – Oct. 19, 2001

Controls:

EPICS IOC benchmarks (number of EPICS database records processed per second) were performed using the SNS standard IOC processor with excellent results for price vs. performance. These tests will be extended to measure IOC loading, channel access network performance, interrupt latency, etc...

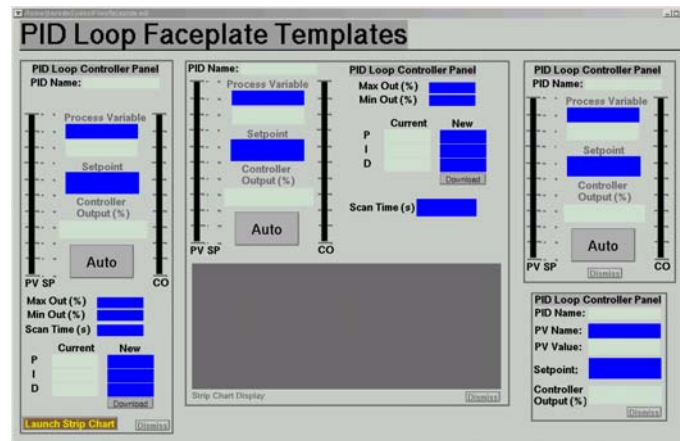
The Controls Private Network at 701 Scarboro was migrated to newly acquired Cisco equipment – the actual equipment slated to be installed for the front end at Chestnut Ridge. A successful fail-over test was conducted on a simulated cryogenic network segment.

The EPICS sequencer was modified to run under Linux.

The Event Link Receiver Altera module and the Real Time Data Link receiver module have been successfully simulated using Altera software. These parts of the design are now ready for hardware testing.

The screen design approach for Conventional Facilities controls was reviewed by Operations and found to be acceptable.

A PID Loop Faceplate was implemented using the SNS EPICS tools. This will be used initially for Conventional Facilities and Cryogenic Systems Applications. (See below)



Tests continued on the power supply controllers and interfaces at BNL, using multiple simulated power supplies. Below is a screen used to control and monitor these tests.

PowerMain-4rth.adl (edited)

Power Supply Manager: HEFT_PS

| NAME | MODE | SELECT | STATUS | SETPOINT | READINGS | | | |
|-------------|------|--------|---------|----------|----------|--------|-------|---------|
| | | | | | I | V | I SET | I ERROR |
| Q42 | ON | DEF | STANDBY | OK | 40.006 | 0.001 | 0.000 | 0.000 |
| Q44_5 | ON | DEF | STANDBY | OK | 40.006 | 0.000 | 0.000 | 0.000 |
| Q48 | ON | DEF | STANDBY | OK | 40.006 | 0.000 | 0.000 | 0.000 |
| Q410 | ON | DEF | STANDBY | OK | 40.006 | 0.000 | 0.000 | 0.000 |
| Q41 | ON | DEF | STANDBY | OK | 40.006 | 0.000 | 0.000 | 0.000 |
| Q43 | ON | DEF | STANDBY | OK | 40.006 | 0.001 | 0.000 | 0.000 |
| Q45 | ON | DEF | STANDBY | OK | 10.000 | 0.000 | 0.000 | 0.198 |
| Q47 | ON | DEF | STANDBY | OK | 100.000 | 89.877 | 0.999 | 89.877 |
| Q49 | ON | DEF | STANDBY | OK | 5.997 | 0.002 | 0.000 | 0.002 |
| Q411 | ON | DEF | STANDBY | OK | 5.997 | 0.001 | 0.000 | 0.000 |
| Q46 | ON | DEF | STANDBY | OK | 10.000 | 0.000 | 0.000 | 0.000 |
| Q48 | ON | DEF | STANDBY | OK | 10.000 | 0.000 | 0.000 | 0.000 |
| Q45 | ON | DEF | STANDBY | OK | 10.000 | 0.000 | 0.000 | 0.000 |
| Q47 | ON | DEF | STANDBY | OK | 10.000 | 0.000 | 0.000 | 0.000 |
| Q42_thr_19 | ON | DEF | STANDBY | OK | 20.000 | 20.000 | 0.000 | 0.000 |
| Q42_thr_18 | ON | DEF | STANDBY | OK | 20.000 | 20.000 | 0.000 | 0.000 |
| Q420 | ON | DEF | STANDBY | OK | 10.000 | 10.000 | 0.000 | 0.000 |
| Q413_thr_19 | ON | DEF | STANDBY | OK | 10.000 | 10.000 | 0.000 | 0.000 |
| Q421 | ON | DEF | STANDBY | OK | 10.000 | 10.000 | 0.000 | 0.000 |
| Q414 | ON | DEF | STANDBY | OK | 10.000 | 10.000 | 0.000 | 0.000 |
| Q415 | ON | DEF | STANDBY | OK | 10.000 | 10.000 | 0.000 | 0.000 |
| Q415 | ON | DEF | STANDBY | OK | 10.000 | 10.000 | 0.000 | 0.000 |
| Q417 | ON | DEF | STANDBY | OK | 10.000 | 10.000 | 0.000 | 0.000 |
| Q421 | ON | DEF | STANDBY | OK | 10.000 | 10.000 | 0.000 | 0.000 |

The ASD Division leader toured the controls team laboratory at BNL. He was undoubtedly more impressed than he appears in this picture!!



ASD/ORNL: Integration and Installation Support

ASD construction walkthroughs continue, and we concurred that 485 feet of tunnel are substantially complete. Two non-conformances, one pertaining to tunnel floor flatness and one regarding the spare CHL transfer line chase, were reviewed. Neither requires a corrective action.

The klystron gallery layout has been revised to accommodate larger racks. No substantive comments have been received, and an engineering change notice will be prepared to approve the drawing revision.

Hand-off planning is essentially complete. Acceptance criteria and turnover plan narratives have been reviewed and commented on by all ASD leads and partner Laboratory counterparts. The Accelerator turnover plan has been issued for final review and comment, and will be completed prior to the November DOE review.

DTL Cold model was received Friday. It will be reassembled in the survey group area. The mock-up of a 402.5 klystron is now finished. The Ring main dipole reference magnet should arrive sometime next week.

It has been decided that we will follow the Jacobs (SNS Construction Manager) ES&H plan for the component installation on site. You can find a copy of this plan on the SNSNTA users drive at: Kristy\Safety\ESH Plan Rev2CN1_Jacobs.

Accelerator Physics

D. Jeon visited LANL to work with the LANL accelerator physics group. In addition to working on commissioning plans, he studied the linac correctors to determine which require machine protection system capability.

J. Galambos visited LANL to participate in PSR development studies. This was a good opportunity to utilize the PSR to perform beam studies to aid the SNS. In particular data was taken for two SNS related experiments. One experiment measured the amount of space charge induced beam broadening induced as an integer resonance is approached. Another experiment investigated the amount of beam broadening and losses for different painting schemes, as a function of intensity. Both these studies will be useful in calibrating the ring simulation tools.

Work progressed on gathering parameters for updating the parameter list and for determining the lattice twiss parameters at the proposed diagnostic locations.

A draft ring and transport line commissioning plan was completed and submitted for inclusion in the Commissioning Program Plan. The plan was sent to BNL for review and comment.

Regarding DTL-CCL commissioning, there was a video conference past Monday, with LANL giving feedback regarding the linac commissioning plan as made up earlier here at SNS. The outline of this plan was finalized and together with the FE and ring parts it was handed as a document to Norbert Holtkamp.

Operations

Last week, we completed the first draft, for comment and revision, of the Commissioning Program Plan, including the Commissioning Accelerator Safety Envelope. A meeting was held to review comments and revisions are underway.

We also worked with CF on EPICS control screens and the Alarm Handler and discussed CF Commissioning.

Ion Source Group

Sachin Babu presented a poster at the SNS poster session. He reported the progress on his effort to perform optical spectrometry on the ion source plasma and to deduce various plasma parameters for diagnostic purposes.

Paul Gibson visited DCS to monitor the progress on the fabrication of the big blue box. We expect it to be delivered beginning of November.

Robert Welton and Martin Stockli moved to the RATS building, reuniting the entire group.

In preparation for the upcoming 7/24 test Cherokee Porcelain has been ordered to coat 4 antennas with 2-layer 0.3 mm thick porcelain.

Travel arrangements have been made for three of us to assist in the 7/24 ion source test at LBNL.

The controls group has installed a passive "front-end/ion" source EPICS screen on several of our computers, allowing us to observe some of the activities at LBNL.

RF Group

Cryo Transfer Line Group

. HL Supply line: 2- 80-foot sections and pull head/vacuum break are complete and ready for installation.

CHL Return line: Pull head complete and being welded to the 39-foot section, 2-40 foot sections in welding.

"T" Sections: Both supply and return "T" sections are in assembly. Approximately 15% completed we are awaiting finale delivery of some machine shop components

Mechanical Group

Magnet Measurement Group

We are anxiously awaiting the arrival of the HEBT Dipole.

Power Supply Group

Bids have been received by LANL for DTL correctors and CCL quadrupole power supplies. Because of recent physics design changes, a modified request for bids will be sent out to bidders soon with these changes incorporated.

A modified magnet handoff/acceptance criteria has been issued for LANL.

There are still uncertainties in the MPS specification for power supplies. A meeting will be scheduled for next week.

Survey and Alignment Group

Beam Diagnostics Group

LBNL SNS Beam Diagnostics Weekly Report:

LBNL activities are concentrated on the transverse emittance measurements. The following is status summary:

- the beamstop has been assembled and is ready for vacuum leak check
- all parts for the emittance scanner slit are complete and ready for assembly
- the beamline support plate is currently being fabricated
- the emittance scanner collector is expected from the vendor the week of 10/22
- the collector actuator is on order, due in mid-November
- the collector chamber and drift tube design is complete, fabrication starting now
- details of collector mounting design waiting on arrival of collector
- motor controller on hand, drivers and power supplies on order, due mid-Nov.
- collector electronics design is near complete
- we have in hand the multichannel vacuum feedthrough which is most likely to be used in the final assembly. The Pre-amp will be mounted in location near this connector.

BNL SNS Beam Diagnostics Weekly Report:

1.5.7.1 BPM:

Completed thermal analysis during bake-out. Calculations indicate a temperature difference of 62 C, measured 70C. The company used for brazing, Wall Colmonoy, will move from PA to OH in 6 weeks. We are hoping that we can still get the four 21cm ring BPMs brazed at PA. Shop estimates next week to finish the four 21cm Ring BPMs. The Ring BPM analog front end electronics is under review.

1.5.7.2 IPM:

A space allocation meeting was held to discuss space requirements. Two IPMs and two bellows will be installed between Q13 and Q1 of the Ring with available space 4.4 meters. The use of C magnets instead of window frame magnets is being reviewed, as is using a single magnet instead of two to restore the orbit.

1.5.7.3 BLM: Leakage testing of the sample LND aluminum chamber BLM indicates problems at high voltage. LND claims the chamber tested well at their facility. We are comparing test methods and returning the test chamber for re-testing at LND. Another unit is expected from LND next week.

1.5.7.4 BCM:

The circuit board has come back from instrumentation and is ready to be married with the digital interface board. Schematics are being updated. Labview software development continues

LANL SNS Beam Diagnostics Weekly Report:

BPMs: Work continues on fabrication of the DTL BPM pickups. New inserts have been brazed. The next step is welding the feedthroughs. The design has been modified to allow a simpler weld of the insert to the BPM body. Two new bodies are in fabrication now as a back up plan. If we stay on the present schedule the BPM delays will not adversely affect the DTL. We have successfully fabricated and tested polyamide inserts for right-angle SMA connectors that will improve the cabling of the pickup inside the drift tube body. The TR, CCL, and SCL pickup bids should be in next week. The lack of a design for the SCL warm inter-segment regions will soon begin to cause delays in the SCL pickups. The analog front end (AFE) has been connected to the digital front end (DFE) / PCI motherboard assembly, and initial tests look promising. Noise levels of just 3.3 bits rms have been observed. We are working on the FGPA code for gain select and self-calibration features. Debugging work is now in progress. The PC chassis are being modified with SMA connectors for the external BPM cables. We are preparing for a nano

workshop on Labview programming for SNS diagnostics, to be held at LANL Oct. 24-25. We shipped a PCI motherboard to BNL on schedule (end of September). At BNL's request, we are preparing a DFE board that we will also ship to them. We are also preparing an AFE/DFE/motherboard assembly for ORNL.

WSs: The Huntington prototype actuator has been mounted to a fixture with a 9-pound weight suspended from it to match the expected vacuum load. It is now being cabled to the motor driver unit for testing in the near future. The remaining two channels of the prototype electronics are being stuffed. Testing of the fully stuffed PC board will commence soon. We submitted the PCR for the MEBT wire scanner electronics, but the PCR system refused it apparently because it has been modified to not accept any changes until the DOE review. This will likely cause further delays in the delivery of the MEBT WS electronics.

ED/FCs: Design work continues on the ED/FCs. Drawing packages for all seven units should go into checking next week. Still to be done is choosing a new material for the high-energy degraders so they will fit through the beam box flanges, and design of the water-cooling lines for the DTL units.

D-plate: Final design work continues.

CMs: The stray magnetic field from the TR quadrupole, at a distance equal to the position of the TR CM, is 120 Gauss. The manufacturer spec is less than 20 Gauss. Some sort of magnetic shield will be necessary.

MEBT slit and collector emittance gear: On hold until the beam box issue is resolved. Tom is working on this.

ORNL-SNS SNS Beam Diagnostics Weekly Report:

We have updated the HTBT, Ring and RTBT diagnostic list. The diagnostic database reflects the changes. We are collaborating with BNL and the AP group to add the diagnostics to the "official" holy-lattice. Craig is working on the non-relativistic beam simulation through the MEBT BPM's. He has made excellent progress on the analytic analysis and those results are consistent with HFSS numerical simulations. Next step is to order the material with dielectric constant of >100 to do bench test. Tom went to Jlab early in the week. He met with Kelley Mahoney and discussed procedures and resources required to raise the QA level of complex diagnostic systems. He met with Tom Powers to learn about their state machine based Labview systems. With Joe Preble, he discussed handling of warm section diagnostics and became a little more familiar with the cleaning process. With John Munson, he visited their electronics lab and followed up on the differential current measurement system that he reviewed a year ago.